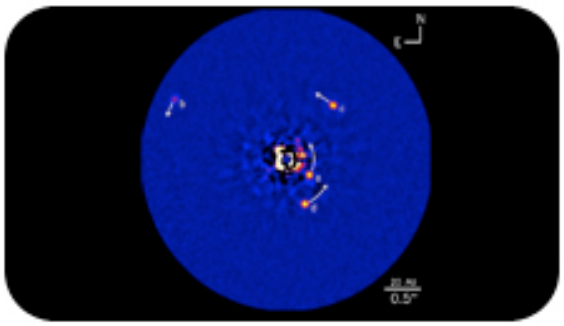
LIVERMORE LAB
REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, Sept. 19-23, 2011.

WIRED

THEY ARE OUT THERE



Researchers were in for a surprise when, in 2010, they found a fourth companion to the HR 8799 system.

While they may look like no more than fuzzy dots, scientists have taken real pictures of other worlds. Over the last few years, astronomers have been learning how to accomplish the difficult task of directly imaging extrasolar planets and have now captured about half a dozen subjects.

Direct imaging is one of the next big vistas in astronomy. Soon, researchers will have telescopes that can focus in greater detail on these exoplanets, providing better information about their atmospheric composition and possibly even detecting signs of life.

"The only way we're going to really nail down an Earth-like planet around a star like our sun is with direct imaging," said Bruce Macintosh, an astrophysicist at the Laboratory.

Though more than 100 new extrasolar planets have been found, all were discovered through indirect methods that detect planets as they dim the light of their parent star as they pass in front of it or gravitationally tug on it to cause a wobble. These techniques can discern a planet's size and location -- important clues to its habitability. But with direct imaging, light from a distant planet can be spread out into a spectrum, providing information about the molecules and compounds in its atmosphere. One day, researchers may find a directly imaged planet that harbors the ingredients of life, such as water and oxygen.

Scientists need to figure out how to block out the light from a vivid star and resolve the much dimmer light reflected by a planet. To accomplish this task with ground-based telescopes, astronomers use adaptive optics to smooth out the blurring of the distant light due to the Earth's atmosphere.

To read more, go to the Web.

LIVE SCIENCE.

UP IN THE CLOUDS

Clouds over the Atlantic Ocean. Salvador, Bahia, Brazil. Photo courtesy of Tiago Fioreze.

For scientists more interested in data modeling than environmental policy, clouds can be a source of aggravation. They come and go without leaving much of a trace, meaning there's no long-term record of their existence like the record that Antarctic ice cores provide for carbon dioxide.

But scientists are getting better at understanding how clouds play into the climate system. No matter what clouds' role, researchers say, they aren't likely to save the Earth from the warming effect of greenhouse gases.

Complicating matters, different clouds have different warming and cooling effects. Researchers now understand that clouds higher in the atmosphere tend to trap extra heat, leading to more warming. Lower clouds, however, remain a bit of a mystery. That's especially true for the very low clouds that hug the coastlines in places like California and the southern coasts of Africa, said Stephen Klein, a Laboratory atmospheric scientist.

"These clouds in particular have different responses in different models," Klein said.

To read more, go to the Web.

Miller-McCune.com CLIMATE CHANGING LIVES

Ben Santer

In his darkest hour, Ben Santer considered walking away from his life's work.

A physicist and atmospheric scientist at the Laboratory, Santer has spent his career detailing the modeled and observed effects of human-induced climate change. His research led to his appointment as the lead author of a key section of the 1995 Intergovernmental Panel on Climate Change assessment report, which concluded, "The balance of evidence suggests a discernible human influence on global climate."

The statement was one of the first, definitively worded assertions from the scientific community recognizing people's role in triggering climate change, and it drew outrage from skeptics and deniers. The critics didn't limit their vengeance to Santer's scientific findings, and accused him of personally manipulating and deleting sections of the report.

"I was very disheartened by what was happening and the highly personal nature of some of the attacks," Santer recalled. "After the assessment report was published and the 'balance of evidence' statement came out, I seriously considered giving up science."

Santer stuck it out, in large part due to the words and encouragement of Stephen Schneider, a colleague from Stanford University and a titan in the field of climate science.

To read more, go to the Web.

R&D

HEAT FROM BELOW

Calpine geothermal power plant at The Geysers near Calistoga, Calif. (Photo by Lewis Stewart courtesy NREL)

Deep inside the earth lies a source of energy just waiting to be tapped.

Geothermal energy is thermal energy generated and stored in the Earth. Thermal energy determines the temperature of matter. Earth's geothermal energy originates from the formation of the planet, from radioactive decay of minerals and from volcanic activity.

The Department of Energy has recently doled out $890,000 to LLNL to help accelerate geothermal energy technology.

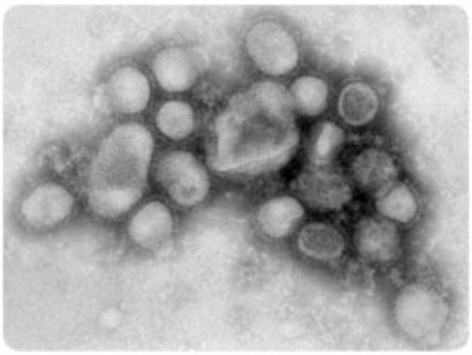
The money will be used for a project that aims to reduce resource explorations costs by developing a processing technique for a variety of geophysical and geological parameters.

LLNL researchers also will partner with Temple University on a project that employs new techniques to better interpret the shape, volume and evolution of a simulated reservoir to optimize its performance.

To read more, go to the Web.

Lab Manager MAGAZINE

ORIGIN OF A VIRUS



H1N1 influenza virus. Image courtesy of CDC.

Where does a virus come from? The question comes to mind this time every year as the flu goes around.

Monica Borucki, a scientist in the Laboratory's Biosciences and Biotechnology Division has won a 1-year contract from the Defense Threat Reduction Agency to study how better to determine the origin of a virus. The $415,000 contract will fund a research project staffed by a team of six Lab scientists.

Knowing the origin of a virus is important in a public health emergency. If the virus appears to be manmade (laboratory grown) rather than naturally occurring, then this might lead to further investigation and become valuable information for the government in responding to a public health emergency.

A virus develops inside a host cell. At a certain point in the virus' development, it emerges from the host cell, through the outer membrane of that host cell and some of the host's membrane proteins are carried on the virus. Borucki's research will study if a person who is infected with a laboratory grown virus makes an immune response specific to the type of laboratory cells that the virus was grown in.

To read more, go to the Web.

To send input to the Livermore Lab Report, send e-mail.

The Livermore Lab Report archive is available on the Web.